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clearly enlarged basal cells which later in the year, when the water is lower, will form in the bed deep carpets of luxuriant green. Thick tufts of *Hygrohypnum ochraceum* are mingled with the latter species and, in deep ravines, the dark strands of *Eurynchium rusciforme* harmonize well with the forest shade, with ends swaying in the swish of clear, cool waters, where *Fontinalis* delights to dwell.

However, these are but glimpses of the world of feather mosses and the best advice we know is to grasp the key to field and woods and hasten away, no matter what the season, leaving dark care behind, to seek forest and streamside, to taste the refreshment of sweet waters in the fulness of the truest pleasure it is given man to enjoy; where you may study the genus *Hypnum*, in the best way of all: at first hand, close to Nature's heart.

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A PRELIMINARY REPORT, WITH NOTES, ON THE LICHENS FOUND NEAR THE CINCHONA BOTANICAL STATION, JAMAICA, BRITISH WEST INDIES

CHARLES C. PLITT

During June and July of 1919, it was my good fortune to spend a vacation at the Government Laboratory, on the summit of Cinchona Hill, on the island of Jamaica. This Hill has an altitude of 5000 feet, the laboratory and gardens, and residence, occupy its summit.¹ In our party were Professor Duncan S. Johnson of The Johns Hopkins University, through whose efforts the trip was arranged and made a success, Mr. William Seifriz, Mr. Louis Pessin, and the writer, members of the Botanical Seminar of the University. The four of us were comfortably housed at the residence, "Belle Vue Cottage," said to be the highest dwelling of any pretensions in the West Indies.² Not far away were our servants' quarters; to the rear of us, and at higher elevation were the laboratories; around us and covering many acres were the gardens with their numerous trees, shrubs, and herbs, grown here for experimental purposes. Among them were *Casuarina*, *Grevillea*, *Callitris*, *Callistemon*, gigantic *Eucalyptus* trees of several species, *Cordyline*, *Gordonia*, and dozens of other plants of interest to the botanist.

As I am interested in the Lichens, it was to them that I turned my attention. Scarcely a day passed that I did not go out to collect specimens. It was not long before my table was simply packed with material in various stages of preparation, some dry, and ready to be sent home, some almost so, some just collected. As soon as collected, I tried as far as possible to assort my material, and, if I could decide upon its generic name, this was appended. I thus soon had piles of *Cladonia*, of *Stictia*, of *Usnea*, of *Leptogium*, of *Graphis*, of *Lecanora*, of *Parmelia*, of

¹ For a detailed account of this interesting place, see, Johnson, "The Cinchona Botanical Station," *Popular Science Monthly*, XII, 1914, and, I, 1915.

² Johnson, *Ibid.*, p. 524.

Lobaria, etc. Specimens that were alike, but collected at different times, or from different localities, were given the same number, but were distinguished from each other by different letters, for example, 69, 69a, 69b, etc. I could then keep track of the number of different species collected with the greatest ease, and took delight in the way this number increased. Each day that I went out, I brought home my collecting bag filled with specimens, many times, too, with almost as much additional material wrapped up in newspaper. In the short stay of six weeks about 200 different species of Lichens were collected. As my collecting ground was limited to the immediate vicinity of Cinchona, to Morce's Gap, to Vinegar Hill Road, to New Haven Gap, to Green River, to Clydesdale, to Latimer River, distant from two to six miles from Cinchona, and, was even further confined to areas along the trails, one may surmise, from the number of species mentioned, that the region is an especially rich one in Lichens. This, however, is not to be wondered at. It probably would be hard to find a place more favorably situated for Lichen growth. According to Shreve,³ Cinchona has an annual mean temperature of 60.8° F., (an absolute maximum of 80°, in August, and an absolute minimum of 46°, in January); it has 105.7 inches of rainfall in a year,⁴ (the minimum amount falling in July, 3.80 inches, the maximum amount in October, 17.91 inches). But besides the abundant rainfall, the mountain sides are bathed almost daily with mists. It is to them that many species owe their luxuriant growth. However, one must not get the idea, that there is here uniformity of conditions that tend to make for a sameness and which would probably become tiresome. Far from it, there are areas far more varied than can be found in most places of similar extent, ranging from treeless mountain slopes, strewn with rock, hardly supporting any vegetation, to mountain sides covered with impenetrable jungle. Here are all sorts of light conditions, and, likewise all sorts of moisture conditions, from most intensely xerophytic to very hygrophytic. Having the opportunity, thus, to study the Lichens, in such varied habitats, one soon has it brought home to him that Lichens are rather the children of light than the children of moisture; they are found on the dry barren hillsides, in the intensest sunlight, but rarely in the deeper shadow of the moist jungles. The ideal situations, are, of course, where there is a fair supply of light, and, at the same time, a liberal supply of moisture, as may be found along the trails through the forested areas. Here one finds Lichens galore, but here, one finds also Hepatics and Mosses in equal abundance. Every available inch of space is covered, and that too, whether it be the ground, rocky ledges, or even the tree-trunks themselves. What keen competition! The slightest advantage that a plant may have over another, is seized to the disadvantage, and final extinction of its competitor. In this struggle, seen on all sides in the ideal localities, the Lichens, by no means play the losing hand. Everywhere one sees that many are well able to take care of themselves. *Sticta* and *Leptogium* species, especially, spread their thalli with the least unconcern over Hepatics and Mosses, which finally succumb, their small

³ Shreve, A Montane Rain-Forest. Carnegie Institution of Washington, Publication No. 199.

⁴ Shreve. Ibid. p. 11. & p. 15.

green leaves being completely shaded; they are, in other words, being starved to death. It is such observations that convince one that the relationship between the two components of the Lichen (Alga and Fungus) must be a most harmonious one; the Lichen behaves as an autonomous unit, a status that could be brought about only by a relationship that is mutually beneficial to the components.

To get a better understanding of the collecting region, I will state that Cinchona Hill is a spur of the main Blue Mountain Range. As already stated, the laboratories and gardens occupy its summit. Trails lead in various directions. There is one that leads right around the summit of Cinchona Hill. But our favorite trail was the one that leads to Morce's Gap, a pass in the main range, and then on to Vinegar Hill. This trail keeps practically at the same level to Morce's Gap, whence it rapidly descends to 3500 feet, and follows the contour of the mountain side, winding in all possible and conceivable directions. It, therefore, happens that there are sunny sides, and less sunny, and even almost shady sides, and, therefore, moist sides, and less moist sides. These trails are not very wide; just wide enough for the laden donkey to make his way safely. On one side, the mountain towers above one, sometimes rising in a gentle slope, 14° – 25° , but oftener much steeper, 25° – 45° , or even 65° . On the other side one looks down the mountain, over tree tops; sometimes into some gigantic bowl, the mountain sides rising up all around; sometimes, however, across the intervening valley and off toward the distant sea. Another favorite walk was to New Haven Gap, along a trail leading up to another trail 500 feet higher than the Morce's Gap Trail, and parallel to it a great portion of the way. Then, too, there was the Latimer River trail, which went in the north east direction to the one taken to Morce's Gap. It was along this trail that we found highly xerophytic conditions, trees being absent much of the way, and the sun shining down and heating the soil almost all day. That the sun could heat up the rock to quite high temperature, even at that altitude, may be observed from the following: on a day when the thermometer registered 20°C . (68°F .) in the laboratories, it registered 40°C . (104°F .) when placed against a tree trunk on which the sun was shining, and 48°C . (118°F .) when placed on a rocky ledge on which the sun was shining. Lichens here were, therefore, subjected to wide ranges of temperature every 24 hours, for, during the night the temperature was quite low, our official lowest being 14°C . (58°F .). It probably was much colder on the ground. Along all these trails one passes deep ravines, and it was a pleasure to explore some of them.

In this preliminary report it has been deemed wise not to attempt any scientific enumeration of the species found, but to leave this rather for a later paper, when all the material collected will have been worked up, and here to classify them by their habit of growth, merely as fruticose, foliose, and crustose forms.

FRUTICOSE FORMS

In this group are various species of *Usnea* and *Ramalina*, and *Theloschistes flavicans*, which cover the branches of the trees, and the various species of *Cladonia*

* Shreve. Ibid. p. 8.

and *Stereocaulon*, and *Sphaerophorus compressus*, which cover the ground and the rocks and the tree trunks. In the sparsely wooded areas, in other words where there is plenty of light and sunshine, trees are literally covered with *Usnea* species, and *Theloschistes flavicans*, the bright yellow of the latter standing out in marked contrast to the former. It was indeed a treat to see such fine specimens of the *Theloschistes*, most of them many inches long; they varied in shades of color, from light yellow to some of a deep orange. Along the trails through the thickly wooded regions, *Usnea* is restricted to the tree tops, and one is hardly aware of its occurrence. If, however, a walk is taken on a day following a windy, rainy night, there will be evidence enough of its presence, in the bits strewn along the trail. The tree top species seems to be almost always *U. florida*, but, in the more open places, where the trees are covered, one finds not only *U. florida* but also *U. dasy-poga*, *U. ceratina*, and *U. rubiginea*. Three species of *Ramalina* were collected, all in the garden of Cinchona: *R. linearis*, *R. denticulata*, and another still to be determined. Of species of *Cladonia*, more than 30 were collected; here will be mentioned only the most common and interesting ones. To me, the most interesting one was *C. aggregata*, and its variety *straminea*. This *Cladonia* was found almost everywhere, especially on moist, poorly illuminated slopes. Its color, size, and general appearance varied greatly; so much so, that one is inclined to think that instead of but one variety, we have here at least three or four. Its peculiar structure interested me right from the start, and I wondered if the holes in the sides of the podetia enabled the plant to absorb and perhaps retain more water than other species of *Cladonia* not having them can do. To see if this were so, I weighed off 1 gram of the air-dried plant, and found that it could absorb, and retain 1.10 grams of water, in other words, in case of rain, it could increase its weight 110%. The same experiment was tried with *C. pycnoclada*, which delights to grow under extreme xerophytic conditions, and I was rather surprised to learn that it could absorb and retain twice its weight of water; in other words, increase its weight 200%. No attempt was made to go deeper into this interesting problem, but enough was done to show that the holes did not assist in increasing the plant's power to absorb water. In all probability they are for aeration. *C. aggregata* is hygrophytic, the holes probably serving the plant to dispose of water.⁶ While on this subject, I will add that a gram of *Stictis aurata* increased its weight 300%; that is, it absorbed and retained three times its weight of water, and *Leplogium bullatum* absorbed and retained four times its weight of water.

To return to the *Cladonias*, both *C. pycnoclada* f. *flavida*, and f. *exalbescens* were found, both on exposed sunny slopes, forming patches of wonderful size. Another *Cladonia* that is sure to attract attention, on account of its beauty, its large size, and prevalence, is *C. squamosa* f. *phyllocoma*; it was at home along the shady trails. Other *Cladonias*, of more or less interest are the following: *C. ceratophylla*, very common; *C. dactylota*; *C. decorticata*; *C. didyma*, quite common on rotting logs; *C. foliacea* (?), very common; *C. furcata* f. *foliolosa*; *C. hypocritica* (?); *C. pellastica*; *C. pityrea*; *C. rangiformis*.

⁶ It would be worth while to study *Cladonia retipora*, in this connection.

The genus *Baeomyces* is represented by at least three different species, *B. absolutus*, *B. intricatus*, and *B. fungoides*. One finds them quite frequently, but patches are never of great extent, as in the case of *B. roseus* with us.

Two *Stereocaulons* were collected, both being found in great abundance. Both are beautiful species—I don't know which is the prettier. *S. cornutum* has a stem (podetium) several inches in length, and unbranched, and grows on slopes exposed to the sun; *S. ramulosum* is branched, is much smaller, and is inclined to grow in more shaded situations. Here, too, must be mentioned the interesting *Sphaerophorus compressus*, growing on tree trunks along the shaded trails, some with podetia of a coral-red color, some almost pure white.

[To be Concluded]]

MOSES OF A STATEN ISLAND HOUSE AND LOT

A. J. GROUT

Some of my most interesting studies have been the careful investigation of the moss-flora of restricted areas, and I always find some surprises.

There are practically no mosses growing on the trees of Staten Island. This I attribute to the gases which cause us so much annoyance and I believe are responsible for a great deal of the respiratory trouble which is ascribed to the "sea air." There are, of course, mosses at the base of trees in the woods, but no *Pylaisias*, *Orthotrichums*, or *Ulotas*.

In view of this it was rather surprising to find a moss on the inside of an unused flue in a cement chimney, thirty feet or more above the ground. I think it was a *Bryum* or *Ceratodon*, but I can find no record and, as the flue is now in use, I can not be sure. In passing, it may be of interest that Mrs. Britton recorded many tree mosses from the Island about twenty-five years ago, more or less.

On the concrete of basement and steps I find: *Bryum argenteum* L.*†, *Leptobryum pyriforme* (L.) Wils.†, *Bryum caespitium* L.*, and *Tortula muralis* (L.) Hedw.*

On the clay soil of garden and lawn: *Catharinea angustata* Brid.*, *Ceratodon purpureus* (L.) Brid.†, *Physcomitrium turbinatum* (Mx.) Brid.*†, *Funaria hygrometrica* (L.) Sibth.*, *Pohlia*, probably *P. nulans* (Schreb.) Lindb., *Bryum bimum* Schreb. or possibly *intermedium* Brid., *Mnium affine* Bland., *Mnium sylvaticum* Lindb., *Amblystegium Kochii* B. S., *A. varium* (Hedw.) Lindb., *Brachythecium acutum* (Mitt.) Sull.†, *B. oxycladon* (Brid.) J. & S.*†, *Eurhynchium hians* (Hedw.) J. & S.†, *E. serrulatum* (Hedw.) Kindb., *Campylium chrysophyllum* (Brid.) Bryhn., and *Hypnum Patientiae* Lindb.†

These twenty except *Funaria*, were all found in one day on a lot 87 × 150 feet.

NEW DORP, RICHMOND BOROUGH, N. Y.

*, With fruit.

†, Abundant.